



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/626,858	07/25/2003	Stephen Duan-Fu Hsu	55071-267	9799

7590 09/27/2006
MCDERMOTT, WILL & EMERY
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER

PARIHAR, SUCHIN

ART UNIT	PAPER NUMBER
----------	--------------

2825

DATE MAILED: 09/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/626,858

Applicant(s)

HSU ET AL.

Examiner

Suchin Parihar

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 April 2006.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-30 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 14 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4/14/06.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is response to application 10/626,858, filed on 07/25/2003, amendment filed on 4/14/2006. The drawings are amended. Claims 1-30 are pending in this application.

Applicant's arguments filed 4/14/2006 have been fully considered but they are not persuasive. The applicable rejections from the prior office action are incorporated herein.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1-3, 5-11, 13-19, 21-27 and 29-30 are rejected under 35 U.S.C. 102(e)** as being anticipated by Capodieci et al. (6,553,562).

3. With respect to claim 1, Capodieci teaches a method of generating masks for printing a pattern having vertically oriented features and horizontally oriented features on a substrate utilizing dipole illumination (i.e. generating mask layouts for use with dipole illumination having horizontal and vertical features, Col 3, lines 51-63), said method comprising the steps of: identifying background areas contained in said pattern (Col 3, lines 65-66, i.e. identifying interconnection areas, also see discussion of sub-

Art Unit: 2825

resolution [background] features, Col 3, lines 20-25); generating a vertical component mask comprising non-resolvable horizontally oriented features in said background areas (i.e. vertical mask pattern w/ shield plan for horizontal features, Col 4, lines 14-18); and generating a horizontal component mask comprising non-resolvable vertically oriented features in said background area (horizontal mask pattern w/ shield plan for vertical features, Col 4, lines 8-11).

4. With respect to claim 9, Capodieci teaches a method of printing a pattern having vertically oriented features and horizontally oriented features on a substrate utilizing dipole illumination (i.e. generating mask layouts for use with dipole illumination having horizontal and vertical features, Col 3, lines 51-65), said method comprising the steps of: identifying background areas contained in said pattern (Col 3, lines 65-66, i.e. identifying interconnection areas, also see discussion of sub-resolution [background] features, Col 3, lines 20-25); generating a vertical component mask comprising non-resolvable horizontally oriented features in said background areas (i.e. vertical mask pattern w/ shield plan for horizontal features, Col 4, lines 14-18); generating a horizontal component mask comprising non-resolvable vertically oriented features in said background area (horizontal mask pattern w/ shield plan for vertical features, Col 4, lines 8-11); illuminating vertical and horizontal component masks utilizing X-pole and Y-pole illumination respectively (Col 3, lines 12-15, i.e. dipole apertures can be of various shapes and orientations, e.g. horizontal, vertical or at any given angle - in lieu of figure 3a-3h).

5. With respect to claim 19, Capodieci teaches an apparatus for generating masks for printing a pattern having vertically oriented features and horizontally oriented features on a substrate (i.e. generating mask layouts for use with dipole illumination having horizontal and vertical features, Col 3, lines 51-65), said method comprising: means for identifying background areas contained in said pattern (Col 3, lines 65-66, i.e. identifying interconnection areas, also see discussion of sub-resolution [background] features, Col 3, lines 20-25); means for generating a vertical component mask comprising non-resolvable horizontally oriented features in said background areas (i.e. vertical mask pattern w/ shield plan for horizontal features, Col 4, lines 14-18); and means for generating a horizontal component mask comprising non-resolvable vertically oriented features in said background area (horizontal mask pattern w/ shield plan for vertical features, Col 4, lines 8-11).

6. With respect to claim 25, Capodieci teaches a computer program product (Col 14, lines 42-44, i.e. use of CAD tool) for controlling a computer comprising a recording medium readable by the computer, means recorded on the recording medium for directing the computer to generate files corresponding to masks for printing a pattern having vertically oriented features and horizontally oriented features (Col 3, lines 51-65) in a multiple-exposure lithographic imaging process (i.e. multiple-exposure lithographic imaging process, Col 3, lines 58-61), generation of files comprising: identifying background areas contained in said pattern (Col 3, lines 65-66, i.e. identifying interconnection areas, also see discussion of sub-resolution [background] features, Col 3, lines 20-25); generating a vertical component mask comprising non-resolvable

Art Unit: 2825

horizontally oriented features in said background areas (i.e. vertical mask pattern w/ shield plan for horizontal features, Col 4, lines 14-18); and generating a horizontal component mask comprising non-resolvable vertically oriented features in said background area (horizontal mask pattern w/ shield plan for vertical features, Col 4, lines 8-11).

7. With respect to claims 2, 10 and 26, Capodiecici teaches all the elements of claims 1, 9 and 25, from which the claims depend respectively. Capodiecici teaches a method of generating masks wherein step of generating said vertical component mask includes: identifying horizontally oriented features contained in said pattern (i.e. vertical mask w/ horizontal features, Col 3, lines 61-63) and providing shielding for said horizontally oriented features (Col 4, lines 15-18, i.e. shield plan for horizontal critical features); applying optical proximity correction assist features to vertically oriented features contained in pattern (Col 8, lines 24-30, i.e. V-masks and H-masks contain type of OPC); and said vertical component mask being utilized to image said vertically oriented features on substrate (Col 3, lines 57-61, i.e. generating complementary mask patterns for use in imaging process).

8. With respect to claims 3, 11 and 27, Capodiecici teaches all the elements of claims 1, 9 and 25, from which the claims depend respectively. Capodiecici teaches a method of generating masks wherein the step of generating said horizontal component mask includes: identifying vertically oriented features contained in said pattern (i.e. horizontal mask w/ vertical features, Col 3, lines 61-63) and providing shielding for said vertically oriented features (Col 4, lines 9-11, i.e. shield plan for vertical critical features); applying

Art Unit: 2825

optical proximity correction assist features to horizontally oriented features contained in said pattern (Col 8, lines 24-30, i.e. V-masks and H-masks contain type of OPC); horizontal component mask being utilized to image said horizontally oriented features on substrate (Col 3, lines 57-61, i.e. generating complementary mask patterns for use in imaging process).

9. With respect to claims 5, 15, and 21, Capodiecici teaches all the elements of claims 1, 9 and 19, from which the claims depend respectively. Capodiecici teaches a method of generating masks wherein said horizontally oriented features comprise a plurality of individual lines extending parallel to one another (i.e. patterning vertical lines that are in the same vertical direction [parallel], Col 3, lines 18-23), each of parallel lines having same width (Col 8, lines 37-42, i.e. HC features based on predefined criteria... such as width).

10. With respect to claims 6, 16 and 22, Capodiecici teaches all the elements of claims 5, 15 and 21, from which the claims depend respectively. Capodiecici teaches a method of generating masks wherein horizontally oriented features have same pitch (Col 14, lines 15-20, i.e. invention applicable to lines and spaces with any given pitch).

11. With respect to claims 7, 17 and 23, Capodiecici teaches all the elements of claims 1, 9 and 19, from which the claims depend respectively. Capodiecici teaches a method of generating masks wherein vertically oriented features comprise a plurality of individual lines extending parallel to one another (Col 8, lines 42-45, i.e. rectangular portions of the polygonal patterns that are VC features – in lieu of Figure 4, #23), each of individual lines having the same width (VC features based on predefined criteria... such as width).

12. With respect to claims 8, 18 and 24, Capodiecici teaches all the elements of claims 7, 17 and 23, from which the claims depend respectively. Capodiecici teaches a method of generating masks wherein vertically oriented features have same pitch (Col 14, lines 15-20, i.e. invention applicable to lines and spaces with any given pitch).

13. With respect to claim 13, Capodiecici teaches all the elements of claim 10, from which the claim depends, herein. Capodiecici teaches a method of printing a pattern wherein shielding prevents illumination [imaging or printing] of horizontally oriented components when vertical component mask is illuminated (i.e. shielding becomes necessary to protect VC features, when HC features are being patterned vice-versa, Col 7, lines 16-22).

14. With respect to claim 14, Capodiecici teaches all the elements of claim 11, from which the claim depends, herein. Capodiecici teaches a method of printing a pattern wherein shielding prevents illumination of vertically oriented components when horizontal component mask is illuminated (i.e. shielding becomes necessary to protect VC features, when HC features are being patterned vice-versa, Col 7, lines 16-22).

15. With respect to claim 29, Capodiecici teaches all the elements of claim 25, from which the claim depends, herein. Capodiecici teaches a computer program product wherein said horizontally oriented features comprise a plurality of individual lines extending parallel to one another (Col 8, lines 34-38, i.e. rectangular portions of polygonal patterns that are HC critical features - in lieu of Figure 4, #22), each of parallel lines having same width (Col 8, lines 37-42, i.e. HC features based on

Art Unit: 2825

predefined criteria... such as width) and same pitch (Col 14, lines 15-20, i.e. invention applicable to lines and spaces with any given pitch).

16. With respect to claim 30, Capodiecici teaches all the elements of claim 25, from which the claim depends, herein. Capodiecici teaches a computer program product wherein vertically oriented features comprise a plurality of individual lines extending parallel to one another (Col 8, lines 42-45, i.e. rectangular portions of the polygonal patterns that are VC features – in lieu of Figure 4, #23), each of individual lines having the same width (VC features based on predefined criteria... such as width) and same pitch (Col 14, lines 15-20, i.e. invention applicable to lines and spaces with any given pitch).

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

18. **Claims 4, 12, 20 and 28 are rejected under 35 U.S.C. 103(a)** as being unpatentable over Capodiecici in view of Applicant's admitted prior art (AAPA).

Capodiecici teaches all the elements of claims 1, 9, 19 and 25, from which the claims 4, 12, 20 and 28 depend respectively, herein. Capodiecici does not teach background area(s) of which do not contain any features to be imaged on a substrate. However AAPA, on lines 15-17 of the specification, disclose a background area where there are

no features to be imaged on the wafer. It would have been obvious to one with ordinary skill in the art at the time of the invention to incorporate AAPA into the method/system of Capodieci because AAPA suggests that shielding techniques are utilized in situations that involve background areas that do not contain any features to be imaged onto a substrate (background, lines 7-9).

Response to Arguments

19. Applicant's arguments filed 4/14/2006 have been fully considered but they are not persuasive.

20. Applicant argues that Capodieci does not disclose or suggest disposing sub-resolution features in the background areas of the mask which have an orientation orthogonal to the features being imaged by the given mask in the dipole imaging process. Examiner disagrees with this assertion.

21. Capodieci, in Col 3 lines 20-30, describes how a horizontal dipole allows for the patterning of sub-resolution [i.e. background] vertical lines or spaces; the terms "vertical" and "horizontal" refer to a set of orthogonal directions in the plane of the geometrical pattern. Therefore, Capodieci implies that the sub-resolution [i.e. background areas] lines are patterned [i.e. disposed] having an orientation that is orthogonal [i.e. vertical] to the horizontal patterns being imaged by the mask in the horizontal dipole process.

22. Applicant argues that Capodieci does not disclose or suggest a mask comprising a plurality of non-resolvable shielding lines disposed in the background portion of the

Art Unit: 2825

mask, which have an orientation orthogonal to the features being imaged by the given mask. Examiner disagrees with this assertion.

23. Capodiecici teaches allowing the patterning of sub-resolution [i.e. background portion] vertical lines and spaces that are orthogonal to the direction of the plane of the geometrical pattern (see Col 3, lines 20-25); Capodiecici also teaches a shield plan for these vertical features [i.e. shielding lines] on a horizontal mask pattern (see Col 4, lines 8-12).

24. In summary, Applicant fails to place claims 1-30 in condition for allowance.

Examiner therefore maintains the rejections of claims 1-3, 5-11, 13-19, 21-27 and 29-30 under 35 U.S.C. 102(e) and claims 4, 12, 20 and 28 under 35 U.S.C. 103(a).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suchin Parihar whose telephone number is 571-272-6210. The examiner can normally be reached on Mon-Fri, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Chiang can be reached on 571-272-7483. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PAUL DINH
PRIMARY EXAMINER

PAUL DINH
PRIMARY EXAMINER


Suchin Parihar
Examiner
AU 2825

